INTERIM **FIVE-YEAR REVIEW**
PRISTINE, INC.

CONCURRENCE

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I. Introduction

The Ohio Environmental Protection Agency (OEPA) and the United States Environmental Protection Agency (EPA) have conducted an interim five-year review of the ongoing remedial action at the Pristine, Inc. Superfund Site, Reading, Ohio. Section 121(c) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and Section 300.430(f)(4)(ii) of the National Contingency Plan (NCP) require that periodic (at least once every five years) reviews be conducted at sites where hazardous substances, pollutants, or contaminants remain after initiation of the remedial action for the site. In addition, it is EPA's policy to conduct Five-Year Reviews at sites with ongoing remedial actions, even when no hazardous substances will remain on the site at the completion of the remedial action. The purpose of a Five-Year Review is to determine continued adequacy and protectiveness of the ongoing remedial action and to evaluate whether Record of Decision (ROD) cleanup goals remain protective of human health and the environment. This is considered an interim Five-Year Review because we have not yet considered input from the group of private parties that are conducting the cleanup under a consent decree with EPA (Pristine Trustees). The Pristine Trustees have a direct interest in the results of this review and have access to considerable expertise in the issues being addressed in this study. Therefore, the Five-Year Review will be finalized following consideration of input from the Pristine Trustees, and any other group or individual that provide comments on this Interim Five-Year Review.

EPA has established a three-tier approach to conducting five-year reviews. The review conducted for this site mainly follows the Type 1 level of review, which includes a risk assessment review in order to evaluate the protectiveness of ROD cleanup goals and the remedy. In addition, we have revisited whether or not any significant concentrations of hazardous substances, pollutants or contaminants will remain on the site at the end of the remedial action. This determines whether or not Five-Year Reviews at this site are required by statute or only be EPA policy.

This five-year review document shall become part of the EPA administrative record file for Pristine, Inc. Superfund Site, which is available for review at the U.S. EPA Region 5 office in Chicago, Illinois. A copy of this document will also be placed in the local repository at the Public Library of Cincinnati and Hamilton County, located at 10980 Thornview Drive, Sharonville, Ohio, and at the Ohio EPA Southwest District Office located at 401 E. Fifth Street in Dayton, Ohio, for viewing during normal business hours.

II. Site History and Characteristics

The Pristine, Inc. site occupies approximately three acres and is located in an industrial area within the City of Reading, Ohio. The site is underlain by the Mill Creek bedrock valley. The lower outwash aquifer above this bedrock valley was formerly the primary source of water supply for the area, including the water supply for the City of Reading, whose wells were formerly only about 300 feet northwest of the site. There is a separate upper aquifer in some parts of the bedrock valley, but below the site ground water is present only in a number of interconnected lenses above the lower outwash aquifer. Mill Creek flows from north to south approximately 600 feet west of the site. Mill Creek is not used for drinking or recreation other than occasionally for fishing.

The site was used as a liquid waste disposal facility from 1974 to 1981. Prior to 1974, the site had been used for the manufacturing of sulfuric acid and fertilizer. In 1977, Pristine, Inc. obtained a permit to incinerate liquid waste on-site and Pristine, Inc. accepted both bulk and drummed waste. The site was closed in 1981 due to numerous permit violations and at the time of closure, more than 10,000 drums and several hundred thousand gallons of bulk liquids were on-site. Some of the chemicals of concern have included the following:

- Polychlorinated biphenyls;
- Pesticides such as DDT, aldrin and dieldrin;
- Volatile Organic Compounds such as 1,2-dichlorethane, methylene chloride, chloroform, benzene, vinyl chloride, tetrachloroethene and trichloroethene;
- Semi-volatile organic compounds such as polynuclear aromatic hydrocarbons, phenol and bis(2-ethylhexyl)phthalate; and
- Metals such as cadmium, lead and mercury; and
- 2,3,7,8-tetrachlorodibenzodioxin (TCDD) in the Pristine incinerator ash.

From 1980 to 1983, most of the drummed material was removed under a consent decree between OEPA and Pristine, Inc. In September 1983, the Pristine site was formally added to the National Priorities List. In 1984, sludges and highly contaminated soils were removed from the site under an Administrative Order on Consent between the USEPA and a group of private parties. The removal actions taken from 1980 through 1984 addressed the immediately hazardous site conditions, but did not address the long term risks associated with contamination in the subsurface soils or ground water.

In 1985, EPA initiated a Remedial Investigation/Feasibility Study (RI/FS) to define the extent and magnitude of the remaining contamination at the site, to characterize threats to human health and the environment, and to evaluate remedial alternatives. The RI included sampling of surface and subsurface soils, incinerator residues, sediments, surface water, and ground water. The sampling results showed that the subsurface soils, and near site ground water were highly contaminated. The RI/FS demonstrated

that there was an unacceptable human health risk from contact with contaminated soils under current site usage, and from usage of ground water near the site for drinking. In addition, the potential for migration of contamination from the site presented an unacceptable risk of contamination the City of Reading water supply.

A Record of Decision was signed on December 31, 1987 and addressed both contaminated soil and groundwater. The selected remedy consisted of the following components:

- Excavation and on-site consolidation of 1,725 cubic yards of sediment and soil;
- In-situ vitrification of contaminated soil to an average depth of ten feet across the site;
- Installation of a french drain along the eastern site boundary;
- Extraction of groundwater from the lower outwash lens/lower aquifer using at least one extraction well;
- On-site treatment of groundwater using air stripper with discharge to Mill Creek;
- Demolition, decontamination and removal of all on-site structures; and
- Access and deed restrictions, and groundwater monitoring

In November 1987, more than 130 parties were notified of their liability at the Pristine site and invited to negotiate with the USEPA for the design and construction of the final remedy. Negotiations with the parties ended on March 29, 1988 without an agreement. On March 31, 1988, a group of private parties proposed to use in-situ soil vapor extraction (ISVE) instead of in-situ vitrification claiming equivalent performance. The proposal was reviewed and it was determined that ISVE would treat the volatile organic compounds but not the pesticides and PAHs in the soil. EPA agreed to reopen negotiations if the parties included thermal treatment (incineration) with ISVE to treat the soil, and maintain the groundwater pump and treatment system as described in the December 1987 ROD using the same cleanup standards for both groundwater and soil. The negotiations were reopened and an agreement reached, which is documented in a Consent Decree signed by 111 parties and EPA. A ROD Amendment was executed on March 30, 1990, after the Consent Decree was lodged in December 1989. The Consent Decree was entered by the Southern District Court of Ohio on October 23, 1990. The parties to the Consent Decree formed the Pristine Trust to implement work under the Consent Decree. Subsequently, all work under the Consent Decree, including sampling, evaluations, design, construction, and operation, and maintenance has been under the direction of the Pristine Trust with oversight by EPA and OEPA. The Pristine Trust has retained the firm Conestoga-Rovers & Associates (CRA) to conduct investigations, design, construction, and operation functions.

The March 30, 1990, ROD Amendment changed the soil component portion of the remedy to the following:

- On-site incineration of the top one foot of soil across Zone A of the site and defined sediment areas, and all other soils from the present ground surface to

four feet below ground surface that contain semi-volatile organic compounds, and pesticides in excess of soil performance goals (the first Explanation of Significant Differences (ESD) dated July 30, 1993 changed the thermal treatment from incineration to thermal desorption, and relaxed the target soil concentration for individual PAHs to 1000 ug/kg because it was impractical to detect PAHs at the previous target concentration of 14 ug/kg);

- placement of incinerator residues on Zone A under a RCRA multimedia cap, which will cover Zone A, if the residues meet the substantive RCRA delisting criteria;
- dewatering the upper 12 feet of soil under Zone A and dewater the Magic Pit portion of Zone B so that these soils can be treated by an in-situ soil vapor extraction system;
- In-situ vapor extraction (ISVE) of on-site soil to a depth of approximately 12 feet below original ground surface over Zone A, and the Magic Pit area of Zone B;
- construction of an off-gas control system for air emissions from the ISVE system;
- treatment of the upper aquifer water from the ISVE system using carbon adsorption.

The City of Reading well field, which supplied water to more than 15,000 people, was located 300 feet northwest of the site. In March 1994, the well field was closed due to contamination. The City of Reading's municipal water is now supplied by the City of Cincinnati. A second ESD was issued in April 1996 that waived Ohio's anti-degradation discharge rule (OAC 3745-1-05) based on a determination that it would be technically impractical to achieve the anti-degradation-based discharge limits for discharge to Mill Creek from the treatment system.

Construction of the remedy for the Pristine site was conducted in five phases. The first phase, demolition of on-site structures, was completed in January 1992. During the demolition, a large portion of the metal from the facility was decontaminated and recycled. Debris from the facility demolition was disposed off-site based upon testing results in either a USEPA approved hazardous or non-hazardous landfill.

The second phase, thermal treatment of soil by thermal desorption technology, was conducted in 1993 and 1994. Approximately 13,000 tons of contaminated soil was treated and placed back on-site. The treated soil was delisted prior to on-site placement. Extensive compliance testing occurred during the operation of the thermal desorption unit and compliance was maintained throughout the life of the project.

The third phase, which included construction of an in-situ soil vapor extraction (ISVE) system and cap, was conducted in 1994 through 1998. The ISVE system contains a series of trenches and wells to remediate both the soil and groundwater in the upper zones of the site. The ISVE system removes approximately 5 gallons per minute (gpm) of groundwater and 1000 cubic feet per minute of soil gas for subsequent treatment.

The ISVE was constructed by 1996, but did not initiate operation until October 1997, when the 150 gpm pump and treatment system initiated operation. This delay was because the ISVE and 150 gpm treatment system use the same air emission control equipment, which included catalytic oxidation and scrubbing. Continuous operation of the south branch of the ISVE system was futher delayed until February 1998 because there was concern that high concentrations of fluoridated VOCs would result in poisoning the catalyst. To address this concern a carbon adsorption unit was installed to treat soil gas from the south branch before it goes to the catalytic oxidizer. The ISVE system is expected to operate for up to 10 years.

The fourth phase, construction of the 150 gpm pump and treatment system, was conducted in 1997, and started operation in October 1997. The 150 gpm system treats groundwater extracted from on-site lower aquifer extraction well EW1 (30-35 gpm), the ISVE shallow groundwater system (5 gpm), and off-site lower aquifer extraction wells EW2 (35 gpm) and EW3 (80 gpm). The treatment train for the groundwater consists of metals precipitation, air stripping and carbon adsorption. A supplemental air stripper (Air Stripper 1A) was added in 1998 to aid in the removal of VOCs from the site ground water. The two air strippers operate in series to treat VOCs down to a concentration of 5 µg/l or less (with the exception of methyl ethyl ketone, which is not amenable to stripping). Groundwater pumped and treated in the 150 gpm system is combined with the treated groundwater from the 300 gpm system and discharged to Mill Creek. Until recently, the off-gas from Air Stripper 1 was treated by the same catalytic oxidizer and scrubber used to treat the ISVE emissions. In August 2001, U.S. EPA approved a request from the CRA to allow the catalytic oxidizer to be deactivated.

The fifth and final phase, construction of the 300 gpm system, was conducted in 1998 and initiated operation in October 1998. The 300 gpm system is designed to cleanup and treat ground water from lower aquifer farther downgradient from the site. At the same time as other activities were being conducted, an extensive lower aquifer investigation was conducted to delineate the contamination within the lower aquifer. The 300 gpm system includes extraction wells EW4 (150 gpm) and EW5 (150 gpm). The treatment train consists of metals precipitation and air stripping. The air stripping tower is designed to treat all VOCs down to a concentration of 5 µg/l or less with the exception of methyl ethyl ketone, which is not amenable to stripping. Groundwater pumped and treated in the 300 gpm system is combined with the treated groundwater from the 150 gpm system and discharged to Mill Creek. The combined discharge is required to meet final effluent limitations and monitoring requirements that went into effect in June and October of 2000.

On September 30, 1998, EPA issued a Preliminary Close-Out Report to document that all construction activity had been completed at the site. The site is now in its fourth year of Operation and Maintenance (O&M) activities.

III. Remedial Action Requirements

Soil Cleanup: Target soil concentrations (in ug/kg) from the ROD as amended to be achieved by thermal desorption and/or in-situ soil vapor extraction are as follows:

- aldrin 15
- benzene 116
- chloroform 2043
- DDT 487
- 1,2-dichloroethane 19
- 1,1-dichloroethene 285
- dieldrin 6
- individual PAH compounds 1000
- TCDD 0
- tetrachloroethene 3244
- trichloroethene 175

These target soil concentrations were derived from one of the following three methods:

- The target soil concentration of each of the eleven indicator compounds selected in the RI was set at the 9.1×10^{-8} risk level for direct contact and incidental ingestion exposures to each individual compound, so that the cumulative risk would not exceed 10^{-6} (ie., $11 \times 9.1 \times 10^{-8} = 10^{-6}$).
- A conservative model determined that leaching of benzene, 1,2-dichloroethane, and trichloroethene from soils could cause these parameters to exceed their MCLs at the City of Reading well field. Therefore, for these parameters only, a back calculation of the soil concentration that would be protective of ground water was performed and the soil target concentrations were set at these lower concentrations.
- During the pre-design sampling for the thermal desorption, it was found that analytical interferences made it impossible to detect the 14 ug/kg target soil concentration for individual PAH compounds. Therefore, the target soil concentration was set at the analytical detection limit that could be achieved, which was 1000 ug/kg.

In addition, the thermal treatment residuals were required to pass RCRA delisting criteria.

Monitoring of Soil Treatment: The ROD requirements regarding the areas for thermal treatment and ISVE were developed from the site history and RI soil sampling. The RI soil sampling included collection of the following soil samples:

- composite samples of surface soils and soils at 12-18 inches below the surface from 12 areas of the site;
- 35 soil samples from 7 soil borings spaced across the soil at depths of from 0 to 8 feet below ground surface;
- 4 soil samples from an 80 foot long and 6 foot deep trench.

These samples were analyzed for VOCs, SVOCs, pesticide/PCBs, and metals.

Sampling to delineate the extent of incineration was completed in 1992, including collection of 266 pesticide, 48 PAH, and 3 dioxin/furan samples from approximately 136 boreholes; and 8 pesticide and PAH from sediment locations. Composite samples from 12 areas of the site were collected to characterize the soils to be thermally treated. These composite samples were analyzed for VOCs, SVOCs, pesticide/PCBs, and metals. According design documents, the thermally treated soil was to be sampled in batches of approximately 300 tons. However, these sample results have not been located by the staff preparing the Five-Year Review.

Also in 1992 for design of the ISVE system, soil gas and soil samples were collected at 43 locations and analyzed for VOCs. In addition, shallow ground water samples were collected and analyzed for VOCs, SVOCs, pesticide/PCBs and metals.

The Operation and Maintenance Sampling and Analysis Plan (SAP) describes monitoring that will be used to assess the performance of the ISVE system. This includes the following:

- annual analyses of soil gas concentrations at 66 probes to assess the progress in achieving the target soil concentrations (on-site analysis for indicator VOCs (benzene; chloroform; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; and trichloroethene) annually, backed up by more complete VOC analyses on a limited number of samples biannually);
- bimonthly pressure and temperature measurement at the 66 probes to evaluate the success of the ISVE system in drawing in vapors throughout the area required for cleanup;
- quarterly water-level measurements to assess the success of the drainage system in dewatering the shallow lenses so that soil vapors can be drawn into the ISVE system.

A method to convert soil gas measurements to approximate equilibrium total soil concentrations has been developed to enable comparison of the soil gas measurements with the target soil concentrations.

The SAP also defines 20 boring locations with three sampling depths per location (for a total of 60 soil samples) for the final soil sampling to evaluate achievement of the target soil concentrations. This sampling will be conducted after the soil gas data indicates that the target soil concentrations have likely been achieved. The SAP provides for analyses of these samples only for indicator VOCs: benzene; chloroform; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; and trichloroethene.

Site Cover, Access, Restrictions, and Deed Restrictions: Under the 1987 ROD, the remedy would comply with either RCRA, Subtitle C, clean closure requirements by achievement of delisting and risk-based closure criteria (in which case only a soil/vegetative cover was required), or would comply with landfill closure requirements by construction of a RCRA-type cap over the site. The 1990 ROD Amendment required construction of a RCRA multi-medial cap over Zone A (but not over Zone B) and stated that hazardous materials would remain on-site under the cap. Subsequently it was

determined that the cap should comply with RCRA Subtitle D (40 CFR 258 Subpart F, and OAC 3745-27-11). Attachment A of Appendix 2 to the 1990 Consent Decree states that the cap for Zone A must meet RCRA performance criteria of promoting drainage, minimizing infiltration, and having a permeability less than or equal to the natural subsoils for the duration of the post-closure period (30 years), and must prevent short circuiting of the air to the ISVE system under Zone A.

The EPA-approved final design provided for the following components of the cap from bottom to top:

- a 24-inch low-permeability clay layer over the soil/desorber residuals;
- a 12-inch sand drainage layer;
- a geotextile filter fabric to reduce the potential for clogging of the drainage layer;
- a 12-inch compacted fill layer; and
- a 6-inch topsoil layer for vegetation.

The only exception is that the access road and parking lot area an 18-inch gravel layer replaces the topsoil and compacted fill. The final design also required the fence to be a six feet high chain-link fence with three strands of barbed wire over the top.

Required deed restriction language was included in the 1990 Consent Decree.

Ground Water Cleanup : Ground water must meet the most stringent of the following limitations: MCLs established under the Safe Drinking Water Act (see Table 9 of the 1987 ROD); a cumulative risk of 10^{-6} ; and the ambient water quality criteria for drinking water (see Table 9 of 1987 ROD). Alternatively for naturally occurring compounds the background concentration approved by EPA is the cleanup target if it is larger than the most stringent of the above three listed limitations. These limitations in ug/l are summarized in Table II of Appendix 2 of the 1990 Consent Decree, as follows:

CARCINOGENS:

• aldrin	0.0012
• arsenic	0.0025
• benzene	0.67
• benzo(a)pyrene	0.0031
• beryllium	0.0039
• chloroform	0.19
• DDT	0.0012
• 1,2-dichloroethane	0.94
• 1,1-dichloroethene	0.033
• dieldrin	0.0011
• TCDD	0.0000002
• tetrachloroethene	0.88
• trichloroethene	2.8
• vinyl chloride	0.02

NON-CARCINOGENS:

- barium 1000
- cadmium 10
- chlorobenzene 488
- chromium 50
- copper 1000
- 1,2-dichlorobenzene 75
- ethylbenzene 2400
- fluoride 4000
- lead 50
- mercury 2
- pentachlorophenol 1010
- phenol 3500
- toluene 15000
- 1,1,1-trichloroethane 200

Ground Water Monitoring: The lower aquifer investigation included 13 rounds of sampling conducted from 1992 through 1999. Ultimately monitoring wells were installation at 18 locations extending as much as approximately 5000 feet southwest from the site. Nests of two to three wells were constructed in most locations for a total of 37 monitoring wells in the lower aquifer. In addition, peizometers were installed near some extraction wells for use in pump tests.

The SAP includes 36 lower aquifer monitoring wells, the five extraction wells, and the ISVE Zone A and Zone B forcemains in chemical sampling; and 36 lower aquifer monitoring wells and 8 lower aquifer peizometers, 11 upper lens monitoring wells, and 9 upper lens peizometers in the hydraulic monitoring. Presently, sampling is conducted annually for the following VOCs: benzene; chloroform; 1,1-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; chlorobenzene; 1,2-dichlorobenzene; ethylbenzene; toluene; and 1,1,1-trichloroethane. Every five years the following additional parameters will be analyzed: aldrin; arsenic; benzo(a)pyrene; beryllium; DDT; TCDD; barium; cadmium; copper; fluoride; lead; mercury; pentachlorophenol; and phenol. Periodically, the annual samples will also be analyzed for additional parameters to assess natural attenuation in the aquifer. The Pristine Trust has also agreed to include available monitoring wells in the shallow lenses in the sampling program for 2001. Hydraulic monitoring is being conducted quarterly.

Surface Water Discharge Limitations: The water discharge from the thermal desorber's scrubber had to meet requirements for discharge to a sanitary sewer.

The final effluent limitations and monitoring requirements for discharge of the ground water after treatment are listed in Attachment 2. ARARs identified in the ROD for the treated ground water discharged to Mill Creek include Section 402 of the Clean Water Act, Ohio Revised Code Chapter 6111, Ohio Administrative Code (OAC) Sections

3745-1-01, -03, -04, -05, -07(A)(2), -30, and Section 3745-7-02(A). The final discharge limitations were based on Best Available Treatment Technology, best professional judgement, and water quality standards. An Explanation of Significant Differences issued in April 1996 waived Ohio's anti-degradation discharge rule (OAC 3745-1-05) based on a determination that it would be technically impractical to achieve the anti-degradation-based discharge limits for discharge to Mill Creek from the treatment system.

Because best available treatment technology standards do not exist for ground water cleanups for all parameters associated with the Pristine pump and treatment system, interim effluent limitations were issued and applied to the cleanup for approximately a two year period starting on the October 1, 1997 start-up date for the 150 gpm system. This provided a two-year period to review the discharge concentrations so that BAT standards could be determined. Following review of the first two years of effluent data, the final effluent limitations for most parameters were established in June 2000. Thirty-three (33) parameters that had not been detected in the treatment system were removed, several parameters were changed to "monitor only" status, and several others were issued revised limits, loadings and/or monitoring requirements. There were also proposed post-ROD revisions based on new State of Ohio water quality criteria for the Ohio River basin for arsenic, copper, lead, and nickel, and new analytical requirements for mercury. These revisions became effective in October 2000 after EPA determined that these revisions were necessary for protection of the environment. The interim limit continued to be in effect for methyl ethyl ketone because the irregularity with which that parameter has been detected in the effluent made it impossible establish the capabilities of the treatment system at that time.

Air Emissions Limitations and Monitoring: For thermal treatment, a trial bum is required consistent with 40 CFR 270.19 and 270.62. Emissions had to be monitored in accordance with 40 CFR 264.347 to evaluate compliance with stack gas performance requirements. This included monitoring of carbon monoxide, combustion temperature, and oxygen. In addition to meeting the soil cleanup requirements, the performance requirements included:

- a destruction/removal efficiency of at least 99.99% for principal organic hazardous constituents (40 CFR 264.343(a)(1);
- particulate emissions less than 180 mg/dscm (40 CFR 264.343(2)(c);
- HCI emissions less than or equal to 4 lb/hr (40 CFR 264.343(2)(b);
- not cause an exceedance of ambient air standards for SO_2, CO, O_3, NO_2, and Pb, or the maximum acceptable ground-level concentrations (MAGLCs) established under OEPA's air toxic review policy.

Ohio Air Pollution Rule 3745 outlines ambient air quality standards consistent with 40 CFR, Part 50. OEPA MAGLCs are based on Threshold Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienists. The TLVs refer to

airborne concentrations of hazardous substances that nearly all workers may be exposed to on a daily basis without adverse health effects. The current OEPA MAGLC is calculated as the TLV divided by 42 (TLV/42). Compliance with MAGLCs were evaluated using ambient air modeling. For metals, the average metals concentrations from the characterization sampling was used to determine emission rates for each metal, which were input into the model to assure that metal emissions would not exceed the MAGLCs.

In addition during the thermal treatment, the contractor was required to use control measures such as water sprays, wind barrier, or foaming agents if organic vapors exceed 5 ppm above background along the site perimeter.

The combined air emissions from Air Stripper 1, Air Stripper 1A, Air Stripper 2, the ISVE system, and the 300 gpm System Aeration Tank are subject to Ohio Administrative Code (OAC) 3745-21-07(G)(2). Under this regulation, no more than 40 pounds of organic material may be discharged to the atmosphere in any one day, nor more than 8 pounds in any one hour, unless the discharge has been reduced by at least 85%. OAC 3745-15-05 contains exemptions for “de minimis” air contaminant sources. “De minimis” sources are those which emit no more than 10 pounds per day of an air contaminant and no more than one ton per year of any hazardous air pollutants or combination of hazardous air pollutants. In addition, the combined emissions must not cause an exceedance of the OEPA MAGLCs.

Subpart AA of 40 CFR Part 264 specifies air emission standards for process vents, such as an air stripper. It is not applicable to air emissions from the site but contains requirements which are relevant and appropriate to the design of the air emissions control device (e.g. the former catalytic oxidizer). Specifically, it requires that total organic emissions from process vents, such as an air stripper, be below 3 pounds per hour and 3.1 tons per year or be reduced by 95% weight. The current emissions from the air strippers are well below these limits.

The SAP required collection of suma canister samples for VOCs from the combined intake to the catalytic oxidizer weekly for the first month, once per month in the second and third month from the start of operation. Subsequently, suma canister samples for VOCs were to be collected annually from the intake of the catalytic oxidizer and the discharge from the scrubber following the catalytic oxidizer. In addition, to satisfy State of Ohio air emission requirements, stack sampling for total VOCs had to be conducted annually.

IV. Remedy Performance

Quality Assurance/Quality Control: All sampling and analyses conducted for the RI, for delineating the extent of thermal treatment, for design of the ISVE system, for the lower aquifer investigation, and for operation and maintenance monitoring in accordance with the SAP were conducted in accordance with an EPA approved Quality Assurance Project Plan.

Thermal Desorption of Soils: Canonie Environmental Services (Canonie) was selected to implement the thermal desorption of soils. Canonie's thermal desorber was a mobile treatment system consisting of a soil pretreatment system, a feed system, an anaerobic thermal processor, a vapor recovery system, a flue gas treatment system, and tailings handling system, and a wastewater treatment system. Canonie conducted four trial burns (called proof-of-process performance tests) prior to full-scale operation. These tests demonstrated that their thermal desorption unit could achieve the required soil treatment requirements and stack gas emission limitations. Canonie's system treated 12,839 tons of soil during full-scale operation. Wastewater from the system was discharged to a sanitary sewer.

According to the Preliminary Closeout Report (EPA, September 30, 1998) (PCOR), the treated soil was thoroughly sampled, was delisted, and then was used as backfill for the Zone A cap. Also according to the PCOR, oversight of the operation by EPA and its contractor was thorough, and in accordance with an EPA approved Compliance Monitoring Plan. An EPA contractor representative was on site during virtually all operational periods. EPA conducted a final inspection on April 19, and on May 2, 1994 declared the thermal desorption complete.

Site Cap Over Zone A, Access Restrictions, and Deed Restriction: According to the PCOR, oversight of this construction was thorough with an EPA or EPA contractor representative on-site during all construction work. All work was in accordance with the EPA-approved Construction Quality Assurance Plan.

In accordance with the EPA-approved Operation and Maintenance Plan (OMP) the site cover is kept mowed, and the cover and fence are inspected weekly. No significant problems have been identified in the weekly inspections.

Acceptable deed restriction language has been in-place since 1990.

ISVE System and Soil Cleanup Monitoring: According to the PCOR, oversight of construction was thorough with an EPA or EPA contractor representative on-site during all construction work. All construction work was in accordance with the EPA-approved Construction Quality Assurance Plan.

The monitoring required in the SAP is being implemented. From this monitoring it has been determined that the ISVE is successfully removing VOCs from the contaminated

soil and possibly from the shallow ground water, and appears to be drawing in soil gas from the entire area of contaminated soil as required. During the initial period of operation from 1998-2000, it is estimated that the ISVE removed over 1,000 pounds of VOC's from subsurface soils. During 2000, there was an increase in VOC mass removed from the previous year, and an increase in concentrations of VOCs detected in the combined vapor stream to the ISVE blower system.

The vacuum readings from the probe have indicated that the ISVE appears to be influencing the required depth and aerial extent of contaminated soil. In response to EPA comments, the Pristine Trust has worked to address areas where no vacuum was indicated, or where soil gas could not be produced at certain probes. This included improving the dewatering system, and addressing certain leaks in the compressed are system for the drainage pumps. As a result, a measurable vacuum was present in a greater majority of soil gas probes, and all probes produced vapor in 2000. This is an improvement over previous sampling rounds. It should be noted that the ROD estimated that 1,000,000 gallons would be extracted from the upper aquifer and treated in order to dewater for the ISVE, but to date more than 6,000,000 gallons of shallow groundwater have been extracted. Thus, the shallow ground water system produces more water than previously predicted.

An analysis of the past six rounds of soil gas sampling data suggest that concentrations of 1,1-dichloroethene, chloroform, 1,2-dichloroethane, trichloroethene, tetrachloroethene, and benzene are decreasing at many sampling locations. However, analyses of summa canister samples collected from a limited number of soil gas probes in June 2000 detected the presence of significant concentrations of vinyl chloride and methylene chloride in soils of the "Magic Pit" area (Zone B) and the south-east corner of Zone A. Vinyl chloride and methylene chloride were detected from a soil gas probe in the "Magic Pit" area (SG-A39) at 160,000 ppb(v/v) and 320,000 ppb(v/v), respectively. Vinyl chloride was also detected in a soil gas probe located in the south-east corner of Zone A (SG-A6) at 18,000 ppb(v/v). These detection are a concern because there are currently no soil target cleanup levels for vinyl chloride or methylene chloride at the site.

In addition to soil gas sampling and analysis, monitoring of the ISVE system also includes sampling of shallow ground water collected from the Zone A and Zone B drainage systems and measurement of water levels. The shallow groundwater sampling data from 2000 indicate an increase in total VOC concentrations in Zone A drainage and a decrease in total VOC concentrations in Zone B drainage. In 2001, in order to monitor the pace of cleanup in the shallow ground water lenses below the site, the Pristine Trust has agreed to sample the available on-site monitoring wells. This sampling should continue to be conducted concurrent with future rounds of ground water sampling to monitor the pace of cleanup of the shallow ground water lenses, and to determine when this ground water meets the ground water cleanup targets.

Ground Water Cleanup and Monitoring: According to the PCOR, EPA or an EPA contractor representative conducted frequent inspections during construction of the 150 gpm system, and the construction was in accordance with the EPA-approved Construction Quality Assurance Plan. Oversight of construction of the 300 gpm system was reduced because of the good record of the Pristine Trustees. EPA inspected the 300 gpm system on September 3 and 23, 1998. The 150 gpm system started operating in October 1997 (the Pristine Trust added a supplemental air stripper in 1998 to assure that the system would achieve discharge standards). The 300 gpm system started operating in October 1998.

The 150 gpm and 300 gpm extraction and treatment systems are designed to capture and draw back the groundwater contaminant plume in the lower aquifer. The Pristine Trust has been implementing the ground water monitoring in accordance with the SAP. The monitoring results have demonstrated that the systems are effective in removing VOCs from the lower aquifer. During the period of 1998-2000, it is estimated that the 150 gpm system removed over 9,500 pounds of VOCs from ground water. The 300 gpm system has operated since October 1998. During 1998-2000, it is estimated that the 300 gpm system removed over 1,200 pounds of VOC's from ground water. In addition, the monitoring appears to indicate that the VOC concentrations are decreasing within the plume (see 1,2-dichloroethane in MW86, in attached figure from year 2000 sampling).

Neither the 150 gpm nor the 300 gpm system can consistently maintain their nominal design ground water extraction rates. This is due to shut-downs due to routine operational adjustments, routine maintenance, equipment failure, process adjustments and optimization, electric problems, and weather conditions. The Pristine Trust has taken the initiative to address persistent or repeated operational problems. In spite of the somewhat reduced average flow rates, the water level monitoring has consistently demonstrated that the system is capturing the entire contaminant plume. This is shown in the attached potentiometric surface map and 1,2-dichloroethene data from year 2000. EPA hydrogeologists have agreed with the CRAs hydrogeologists that the area of ground water capture probably extends beyond outermost monitoring wells, and that the extent of Pristine's plume is probably best defined by the extent of 1,2-dichloroethane contamination, which appears to end at the outermost monitoring wells (see attached figures from year 2000 sampling).

The attached figure showing the distribution of trichloroethene (TCE) shows a potential problem because the TCE increases considerably at the outermost monitoring wells. EPA hydrogeologists concur with the CRA hydrogeologists that this increase in TCE is very unlikely to be from ground water migration from Pristine. Although TCE in the outermost monitoring wells is most likely not from Pristine, it could cause a problem if it results in Pristine pulling a substantial TCE plume towards the extraction wells. The continued monitoring will be used to detect this potential problem. In addition, the

United States Geological Survey with funding from EPA is in the process of constructing a couple additional monitoring wells to help assess this potential problem.

Containment of the upper outwash lenses by the ISVE drainage system is difficult to evaluate because the lenses are discontinuous and limited in extent. It is known that these lenses are connected to the lower aquifer. Because the pump and treatment system contains and removes ground water in the lower aquifer, this migration route is an inherent part of the cleanup. The possibility of discharge to Mill Creek is a concern. In the RI the potential for this westward migration was primarily through the middle lens. The water elevations in the shallow lenses now indicate that this is very unlikely. In the RI the westward migration through the middle lens was mostly characterized by GW62, which is about 150 feet west of the site. This monitoring well is now dry. In addition, water levels in peizometers and monitoring wells in or near Zone B (P6, P7, P8, P9, GW 55, GW 56, GW 63) are lower than any of the other water levels in the shallow lenses on or near the site (except for GW65 to the east of the site). This suggests that ground water in the shallow lenses most probably drain towards Zone B, where it is extracted rather than migrating west of the site towards Mill Creek.

Compliance with Surface Water Discharge Limitations: Prior to start of operations, the Pristine Trust expressed concern that the discharge limitations for methylethylketone, copper, cadmium, and zinc were near concentrations detected in the ground water. Between October 1997 and October 1998, the 150 gpm system operated alone. There were a number a shut-downs during this period in response to exceedances of the interim discharge limitations. An exceedance for copper was traced to contamination from regenerated activated carbon, which was then replaced with virgin carbon. Selenium exceedances turned out to be an analytical error. Methylethylketone (MEK) exceedances were caused by methethylketone in the influent, and the fact that MEK is poorly removed by air strippers. In response to this, EPA approved an increase in the interim limits for MEK for the combined 450 gpm effluent.

CRA identified exceedances of the interim discharge limit for copper in two weekly samples from the 450 gpm discharge in April 1999, and in one weekly sample in April 2000. In April 1999, the system was shut-down to investigate the problem. In both cases, subsequent samples indicated that copper was less than the discharge limit, so the system was re-started, and the cause of the copper detections could not be determined. During the first two years of operation, the CRA conducted a number of studies and made additions and changes to improve the performance of the 150 gpm and 300 gpm systems. This included adding another air stripper (Air Stripper 1A) in series with Air Stripper 1 in 1998.

In June 2000, the 150 gpm system was shut down in response to low pH in the discharge (the 300 gpm system was shut-down for maintenance). The problem was caused by a defective pH probe, which was replaced, and an alarm and automatic shut-

down system was added to provide a warning an shut-down the system if the pH of the system is outside the required range. Stream monitoring detected no impact from this event.

The final discharge limitations became effective in June and October of 2000. Due to the fact that these criteria were recently reviewed, they were not reevaluated during this five-year review. However, the elevated interim limit for MEK was reviewed. Ohio EPA has decided that MEK will continue to have interim limits of 100 µg/l, 30-day average, and 200 µg/l, daily maximum, until the next five-year review in August 2006. Final permit limits for MEK will be set at that time, if appropriate. The decision to continue with the interim limits is due to sporadic detections of MEK, and the fact that it can not be effectively removed by air stripping. MEK was not detected in effluent samples collected in January, February, April, May, June, or July of 2001, but was detected at 17 µg/l in a March 2001 effluent sample. It is intended that continued monitoring will allow further data collection and evaluation.

Recently, total residual chlorine has sporadically been detected exceeding the final discharge limitation in the 450 gpm effluent. Total residual chlorine exceeded the final discharge limitation in weekly effluent samples collected on July 18, July 25, August 15, and August 29, 2001. Because neither chlorine nor related chemicals are used in the treatment system, the residual chlorine detections could not be from the treatment system. In addition, residual chlorine is thermodynamically unstable and could not be generated from degradation of chlorinated organic compound in the ground water. CRA's investigation showed that the residual chlorine was present in the drainage from Zone A and Zone B. CRA has theorized that the residual chlorine is coming from a leaky discharge line of unknown origin that runs along the railroad tracks next to the site. Leakage from this line could flow into the Zone A and Zone B drainage systems. CRA has continued to operate the system, but has submitted a force majeure notice regarding the total residual chlorine exceedances. EPA is relying upon OEPA's surface water specialists to review the significance of these exceedances, while the source of the residual chlorine is under investigation.

Compliance with Air Emission Limitations and Monitoring: According to the Final Treatment Facility Design Report (CRA, 1997), the total VOC emissions without controls from the ISVE system and 150 gpm groundwater treatment system were estimated at 293 pounds/day or 54 tons per year at start-up. These air emissions, which were based on initial VOC concentrations in contaminated soil and groundwater at the site, were in excess of the allowable levels and therefore required controls. This motivated the installation of a catalytic oxidizer followed by a scrubber for VOC and HCI emissions control. After initial testing, there was concern that high concentrations of fluorinated compounds present in the south branch of the ISVE system would poison the catalyst in the catalytic oxidizer. To address this, two 3000 pound carbon vessels in series were used to pretreat soil gas removed form the south branch of the ISVE

system before it went lo the catalytic oxidizer. The carbon treatment was discontinued in September 1999 because the concentration of fluorinated compounds in the soil gas decreased.

The Pristine Trust conducted annual stack tests on the discharge from the catalytic oxidizer for total VOC and HCI emissions in 1998, 1999 and 2000. In each year, the emissions were less than the emission limitations in OAC 3745-21-07(G)(2). The Pristine Trust did not fully implement the VOC sampling required in the SAP because at the time of the stack tests VOC samples were only collected from the intake, but not the discharge from the catalytic oxidizer in 1998 and 1999, and were only collected from the discharge at the time of the stack test in 2000. As a result, a result a valid destruction efficiency for the catalytic oxidizer could not be calculated, and we could not fully evaluate compliance with the MAGLCs in 1998 and 1999. The VOC sample collected from the discharge in 2000 indicated compliance with the MAGLCs. However, although the vinyl chloride emissions would not cause an exceedance of the MAGLCs, vinyl chloride emissions were higher than expected.

In March 2001, the combined air emissions from all site sources without controls were estimatedat 0.23 pounds per hour and 5.1 pounds per day, well below regulatory limits, and CRA requested permission to shut-down the catalytic oxidizer. CRA collected concurrent VOC samples from the intake and discharge from the catalytic oxidizer in May 2001. An unexpected result was that although there were 85-90% reductions in the most highly concentrated VOCS (chloroethane, methylene chloride, and chloroform), the vinyl chloride concentration increased by more than an order of magnitude.

In August 2001, U.S. EPA approved a request from the Pristine Trust to allow the catalytic oxidizer to be deactivated. U.S. EPA and Ohio EPA have determined that operation of the catalytic oxidizer is no longer necessary to comply with Ohio air standards or for protection of human health and the environment. However, the air stream will be monitored by a continuous emission monitor, and monthly VOC samples will be collected during the first year after deactivation. In addition, there is a plan for responding to any significant increase in emissions.

Site Visits: The Pristine, Inc. site was visited by staff from EPA and OEPA on March 19, 2001, April 10, 2001, and July 10, 2001 as part of site review meetings. The visits included a walkover of the site, a guided tour of the treatment plant, detailed explanations of the remedial systems and treatment processes, and visits to the off-site groundwater extraction well vaults, monitoring wells, and the outfall to Mill Creek. With the exception of some maintenance work being performed to replace a leaking pipe during one visit, the site and the remedial action appeared to be in good condition and operational. The site cap was well vegetated and the fence around the site was intact.

The April 10, 2001 and July 10, 2001 site review meetings were also attended by staff from the U.S. Geological Survey, the Pristine Trustees, and CRA. Technical issues related to the remedial action and monitoring results at the site were discussed in detail at these meetings.

V. Risk Assessment Review

A screening level risk assessment was conducted by Janusz Z. Byczkoski, Ph.D, D. Sc., D.A.B.T of OEPA in order to assess whether the existing soil and ground water cleanup targets will result in the remedy being protective of human health and the environment at the end of the remedial action. Dr. Byczkoski largely used generic assumptions from the Region 9 PRGs for this screening and did not take into account cumulative effects of exposure to multiple parameters. The Region 9 PRGs use EPA toxicity factors and defined generic exposure assumptions to identify concentrations of individual parameters that will be protective to a maximum of the 10^{-6} incremental cancer risk level and for non-carcinogens to a hazard index of 1.0. The risk assessment report is included in Attachment 1 and contains more detail on the methodology and calculations for the risk assessment. The risk assessment provides documentation that supports revision of the ROD target cleanup concentrations for some parameters.

Vinyl Chloride and Methylene Chloride: Vinyl chloride and methylene chloride were not indicator parameters for soil contamination, and, as a result, were not assigned a target soil concentration. Similarly, methylene chloride was not assigned a target ground water concentration. However, analytical results from summa canister samples collected from a limited number of soil gas probes in June 2000 indicated the presence of substantial concentrations of vinyl chloride and methylene chloride in soil gas collected from the “Magic Pit” area (Zone B) and the south-east corner of Zone A. Vinyl chloride and methylene chloride were detected in a summa canister sample from a soil gas probe in the “Magic Pit” area (SG-A39) at 160,000 ppb(v/v) and 320,000 ppb(v/v), respectively. Vinyl chloride was also detected in a summa canister sample from a soil gas probe located in the south-east corner of Zone A (SG A6) at 18,000 ppb(v/v).

Based on the summa canister sample results, it can be estimated that vinyl chloride is present in soils of the “Magic Pit” area at concentrations as high as over 200 µg/kg. Because vinyl chloride is a normal product of degradation of trichloroethylene (TCE), its concentration may rise over time. Similarly, methylene chloride can be estimated to be present at greater than 8,000 µg/kg. Review of the design data also indicate that vinyl chloride and methylene chloride were present at substantial concentrations and were parameters that were considered in the design of the ISVE system.

Vinyl chloride was not detected in soil samples during the RI, but that may have been due to loss of the most volatile components during soil sampling because of the sampling procedures used at that time. Improved soil sampling procedures are now available. It appear that methylene chloride was not considered in the RI because of blank contamination. For these reasons the risk assessment in this review focused on vinyl chloride and methylene chloride in addition to the indicator parameters from the ROD.

ROD Cleanup Goals - Soil and Sediment: Table I of Attachment 1 identifies Dr. Byczkoski's recommendations for amending the target soil concentrations. It is noted that no change is recommended for the non-volatile chemicals (other than TCDD) because the existing target soil concentrations are less than the Region 9 PRGs. For TCDD, Attachment 1 correctly points out that the target soil concentration of 0 is unverifiable. This actually meant that TCDD should be below the analytical detection limit. Therefore, we need to find out what the analytical detection limit was at that time, in order to better quantify the target soil concentration for TCDD. We also need to check the soil analyses after thermal desorption to make sure that there were no detections.

Attachment 1 recommends consideration adding target soil concentrations for vinyl chloride and methylene chloride, and lowering target soil concentrations for chloroform and 1,1-dichloroethene. According to Attachment 1, the threat to ground water should control the target soil concentration (see Table XI). Table XI also indicates that tetrachloroethene may be a threat to ground water at the present target soil concentration. This evaluation also indicates that vinyl chloride and methylene chloride should added to the list of parameters routinely included in the annual soil gas sampling, and in the final soil sampling event.

ROD Cleanup Goals - Ground Water: Attachment 1 also evaluates the ROD target ground water concentrations. Based on new toxicity data, lower target ground water concentrations are recommended for pentachlorophenol, chlorobenzene, ethylbenzene, toluene, and lead. In addition, a new target ground water concentration is recommended for methylene chloride. Methylene chloride should also be added to the ground water monitoring parameters.

In addition, it was found that bis(2-ethylhexyl)phthalate (BEHP) was the most prevalent and highly concentrated SVOC detected during the RI. BEHP was not seriously evaluated during the RI because of potential sampling contamination, and because accepted toxicity constants were not available for BEHP at that time. Since the RI, BEHP has been categorized as a probable human carcinogen. The Region 9 PRG for tap water is 4.8 ug/l. Therefore, BEHP should be added to the ground water monitoring program, and consideration should be given to adding a target ground water concentration.

VI. Residuals That Will Remain On-Site After Achievement of the Target Soil and Ground Water /Concentrations

If the previously identified concerns are addressed, all Region 9 PRGs for ground water and all Region 9 PRGs for organic compounds in soil should be achieved at completion of the remedial actions. Therefore, the only possible remaining parameters of concern would be metals in the soil below the Zone A cap. To evaluate the significance of this potential contamination, the average metals in soil concentrations from the incinerator characterization sampling (Table 4.3 of the Prefinal Design Report for Thermal Treatment of Soil, CRA, December 1992) are compared to the Region 9 PRGs for metals in the following table

PARAMETER	AVERAGE SOIL CONCENTRATION (MG/KG)	REGION 9 PRG RESIDENTIAL SOIL (MG/KG)	REGION 9 PRG INDUSTRIAL SOIL (MG/KG)
Antimony	12	31	820
Arsenic	12	0.39	2.7
Barium	78	5,400	100,000
Beryllium	0.5	115	2,200
Cadmium	2.1	37	2,600
Chromium	58	210	450
Copper	31	2,900	76,000
Lead	194	400	750
Manganese	335	1,800	32,000
Mercury	1.4	23	610
Nickel	13	1,600	41,000
Silver	2.3	390	10,000
Thallium	1	5.2	130
Zinc	97	23,000	100,000

The table shows that only the average concentration of arsenic exceeded the Region 9 PRGs for residential soils. However, 12 mg/kg of arsenic is within the Region 9 PRG

non-cancer end point, less than the 10^{-4} risk level, and is likely to be within the range of normal background arsenic in soil concentrations in that area. Based on this preliminary evaluation, it appears that the site will be acceptable for unrestricted usage if the soil and ground water target concentrations are achieved. To fully evaluate the significant of metal contamination remaining below the cap, the RI data, other design data, and post incinerations sampling data should be reviewed.

VII. Conclusions

- Thermal treatment was performed over the entire area required in the ROD, and resulted in achievement of the target soil concentrations for all non-volatile parameters over essentially the whole site.
- The site cap was properly constructed over Zone A and over the thermal treatment residuals, and is being properly maintained. Therefore, we believe that it is serving its function of temporarily preventing direct contact exposure to the soil, reducing infiltration through Zone A soils, and preventing short-circuiting of the ISVE system;
- The site fence was properly constructed around the site, and is being properly maintained. Therefore, we believe that access to the site by unauthorized persons is adequately restricted.
- Proper deed restrictions have been placed on the property, in accordance with the 1990 Consent Decree.
- The ISVE system was constructed in accordance with the approved design, and is being properly operated, monitored and maintained. We believe that the ISVE drainage system has dewatered the area enough for the system to induce a pressure gradient in the unsaturated soil zone so that the depth and areal extent of soil required in the ROD can be cleaned up by the ISVE system. The ISVE system is successfully removing VOCs from the soil and possibly from shallow ground water, and soil gas concentrations appear to be decreasing with time.
- The ground water pump and treatment system was constructed in accordance with the approved design, and is being properly operated, monitored and maintained. We believe that all ground water contaminated by Pristine that exceeds the target ground water concentrations is within the capture zone of the pump and treatment system in the lower aquifer, or the ISVE drainage system in the upper lenses. The pump and treatment system is successfully removing VOCs from the ground water, and ground water concentrations of VOCs are decreasing.
- The Pristine Trust has been very responsive and responsible in reporting and addressing the exceedances of the discharge limitations. The apparently brief exceedances of the copper maximum discharge limitation have not been a significant concern to EPA or OEPA. The recent exceedances of the discharge limitation for total residual chlorine are not caused by Pristine contamination nor by any chemical addition within the treatment processes.

- Air emissions have been in compliance with all requirements, and the air emission will be thoroughly characterized during the first year after deactivation of the catalytic oxidizer.
- the risk assessment review determined that certain target soil and ground water concentrations are not low enough to be protective of human health and the environment at the end of the remedial action, and that certain parameters need to be added to the monitoring program.

VIII. Recommended Actions

- It is possible that the ground water pump and treatment system is pulling a significant plume of trichloroethene at the southwestern end of the monitoring well network. This will have to be monitored over the years. In addition, an investigation into the source and extent of this trichloroethene contamination should be conducted.
- EPA, OEPA and the Pristine Trust need to cooperate in locating and addressing the source of the total residual chlorine that is causing periodic exceedances of the discharge limitation. EPA and OEPA need to evaluate the significance of the recent periodic exceedances of the discharge limitation for total residual chlorine.
- The Pristine Trust wants to conduct sampling to evaluate whether the discharge limitations for some metals is more stringent than necessary. OEPA and EPA need to review this sampling.
- EPA, OEPA and the Pristine Trustees need to conduct further evaluation of the heath risks from chloroform, 1,1-dichloroethene, methylene chloride, vinyl chloride, tetrachloroethene and TCDD, in order to establish target soil concentrations that will be protective of human health and the environment, and achieve ARARs at the end of the remedial actions.
- EPA, OEPA and the Pristine Trustees need to conduct further evaluation of the health risks from methylene chloride, pentachlorophenol, chlorobenzene, ethylbenzene, toluene, lead and bis(2-ethylhexyl)phthalate, in order to establish target ground water concentrations that will be protective of human health and the environment and achieve ARARs at the end of the remedial actions.
- The following parameters need to be added to the SAP: methylene chloride and vinyl chloride in the annual soil gas measurements, and in the final soil sampling to evaluate achievement of the target soil concentrations; methylene chloride in the annual ground water sampling; and bis(2-ethylhexyl)phthalate to the five-year interval ground water sampling.
- A more complete review of historical metals data should be conducted to characterize the metals concentrations that remain on-site. If metals concentrations are low, and target soil and ground water concentrations are achieved, then it is possible that the site should be available for unrestricted usage after completion of the remedial actions.
- In 2001, in order to monitor the pace of cleanup in the shallow ground water

lenses below the site, the Pristine Trust has agreed to sample the available on-site monitoring wells. This sampling should continue to be conducted concurrent with future rounds of ground water sampling to monitor the pace of cleanup of the shallow ground water lenses, and to determine when this ground water meets the ground water cleanup targets.

- The final effluent limitations and monitoring requirements for the site are listed in Attachment 2. Due to the fact that these criteria were established during the last year, they were not reevaluated during this five-year review. However, the elevated interim limit for MEK was reviewed. Ohio EPA recommends that MEK continue to have interim limits of 100 µg/I, 30-day average, and 200 µg/I, daily maximum, until the next five-year review in August 2006. Final permit limits for MEK will be set at that time, If appropriate.
- Background concentrations of arsenic in soil and ground water should be determined.

IX. Statement on Protectiveness

Although the remedial actions are being properly implemented, we can not determine at this time whether the remedy is currently protective of human health and the environment because the OEPA and EPA have not evaluated the significance of the sporadic total residual chlorine exceedances. The following actions need to be taken to ensure the long-term protectiveness of the remedy:

- the extent of trichloroethene contaminations at the southwestern edge of the monitoring well network needs to be characterized;
- health risks from chloroform, 1,1 -dichloroethene, methylene chloride, vinyl chloride, and tetrachloroethene in soil need to be further evaluated and protective soil target concentrations established;
- health risks from methylene chloride, pentachlorophenol, chlorobenzene, ethylbenzene, toluene, lead and bis(2-ethylhexyl)phthalate in ground water need to be further evaluated and protective ground water target concentrations established;
- methylene chloride and vinyl chloride need to be added to the parameter list for the annual soil gas measurements, and for the final soil sampling to evaluate achievement of the target soil concentrations;
- methylene chloride and bis(2-ethylhexyl)phthalate need to be added to the parameter list for ground water sampling.
- periodic sampling of the monitoring wells in the shallow lenses needs be conducted.

EPA is taking the steps outlined in Section VIII, Recommended Actions, to make the remedy protective.

IX. Next Five-Year Review

The next five-year review will be conducted in August 2006.

REFERENCES NOT IN ADMINISTRATIVE RECORD

Preliminary Design Report for Thermal Treatment of Soil (Ten Percent Design), Conestoga-Rovers & Associates, September 1992

Pre-Final Design Report for Thermal Treatment of Soil (Ninety Five Percent Design), Conestoga-Rovers & Associates, December 1992

Pristine, Inc. Superfund Site ISVE Pilot Study Technical Memorandum, Conestoga-Rovers & Associates, August 30, 1993

Final Design Report (One Hundred Percent Design Report) In Situ Soil Vapor Extraction System and Cap, Conestoga-Rovers & Associate, August 1994

Final Treatment Facility Design Report, Conestoga-Rovers & Associates, 1997.

Operation and Maintenance Sampling and Analysis Plan, Conestoga-Rovers & Associates, July 31, 1998

Operation and Maintenance Plan, Conestoga-Rovers & Associates, July 31, 1998

Preliminary Closeout Report, EPA, September 30, 1998

Operations and Maintenance Quality Assurance Project Plan, Conestoga-Rovers & Associates, November 1999.

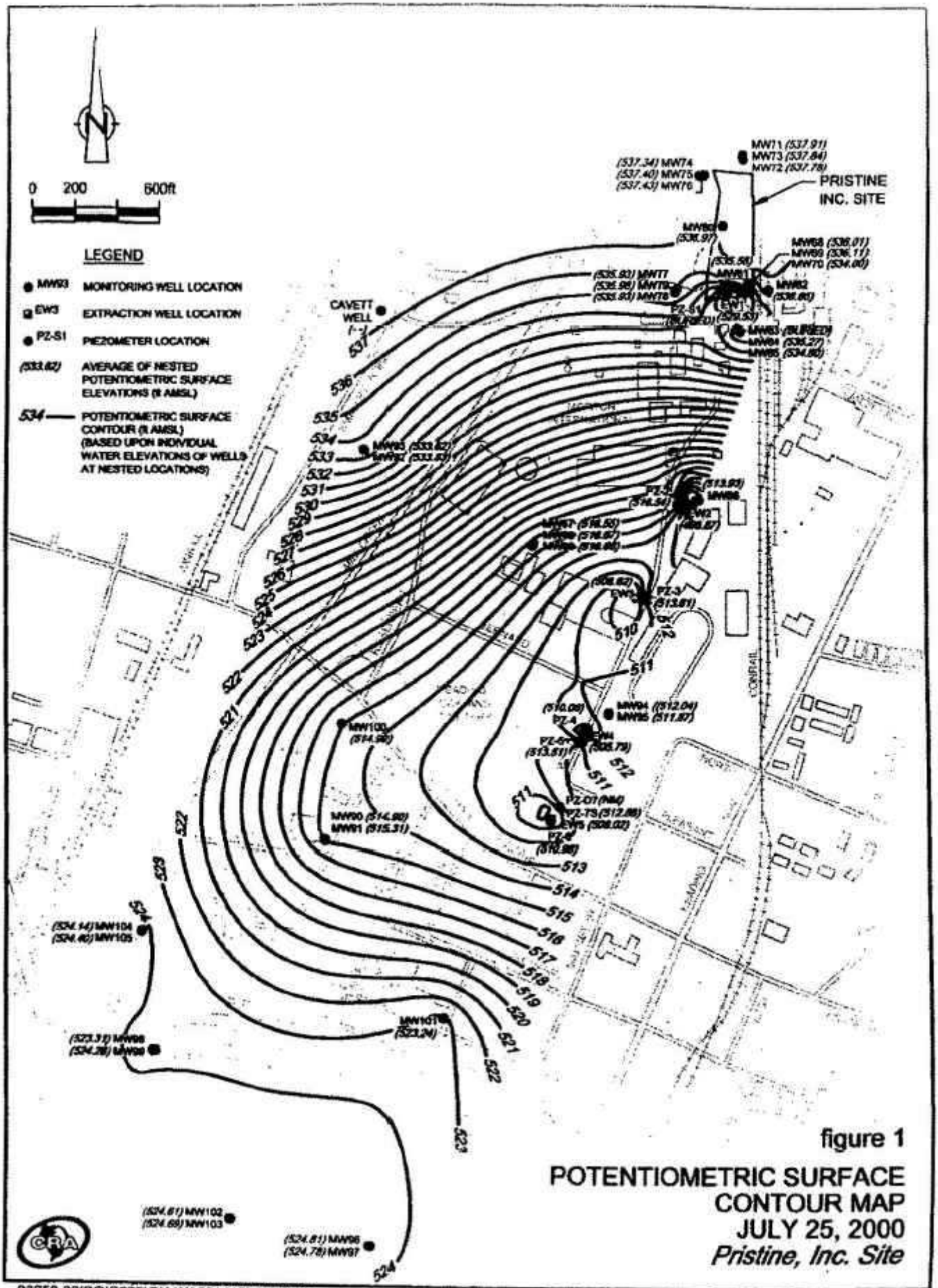

figure 1

POTENTIOMETRIC SURFACE CONTOUR MAP
JULY 25, 2000
Pristine, Inc. Site

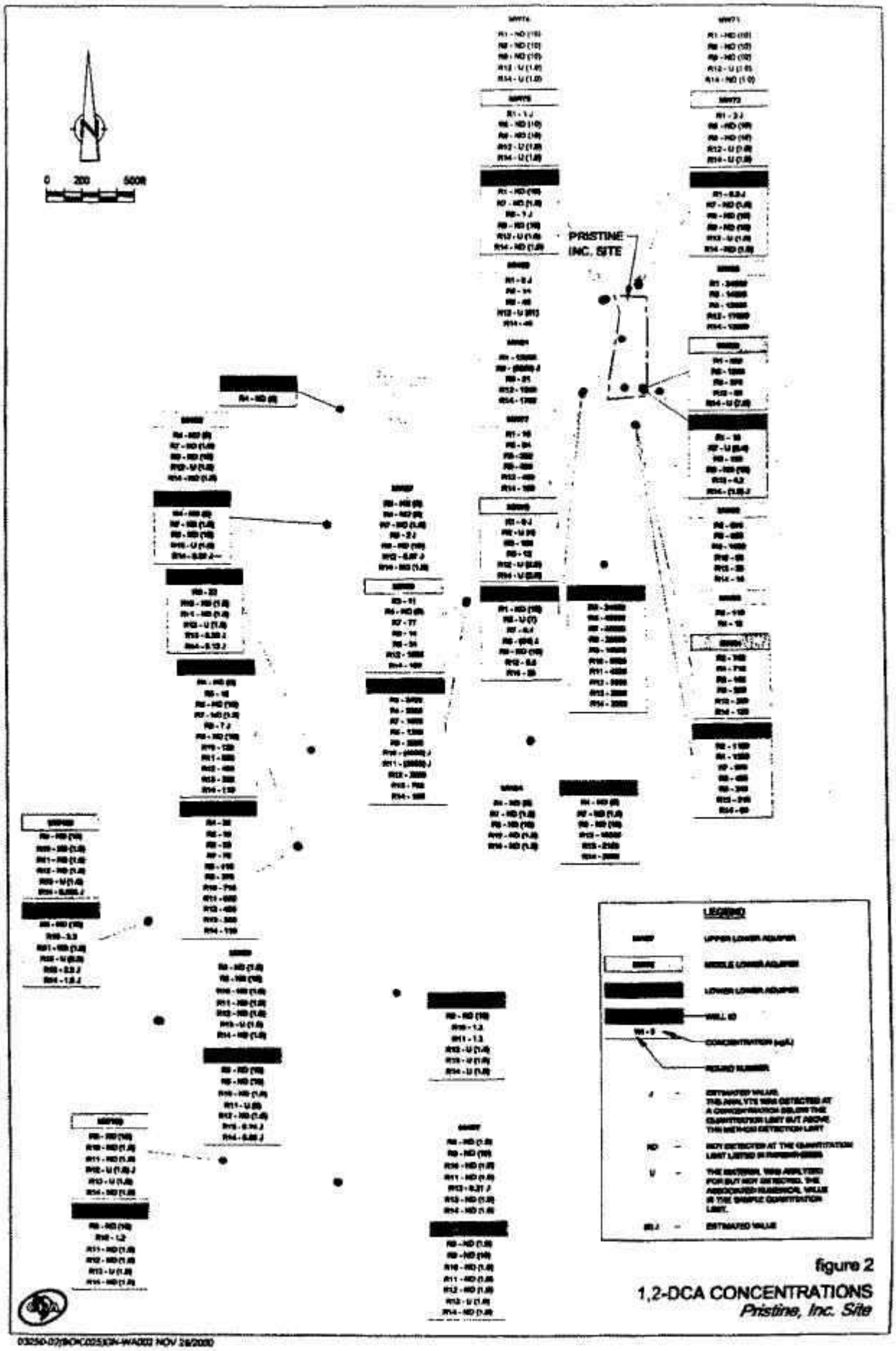

figure 2

1,2-DCA CONCENTRATIONS

Pristine, Inc. Site

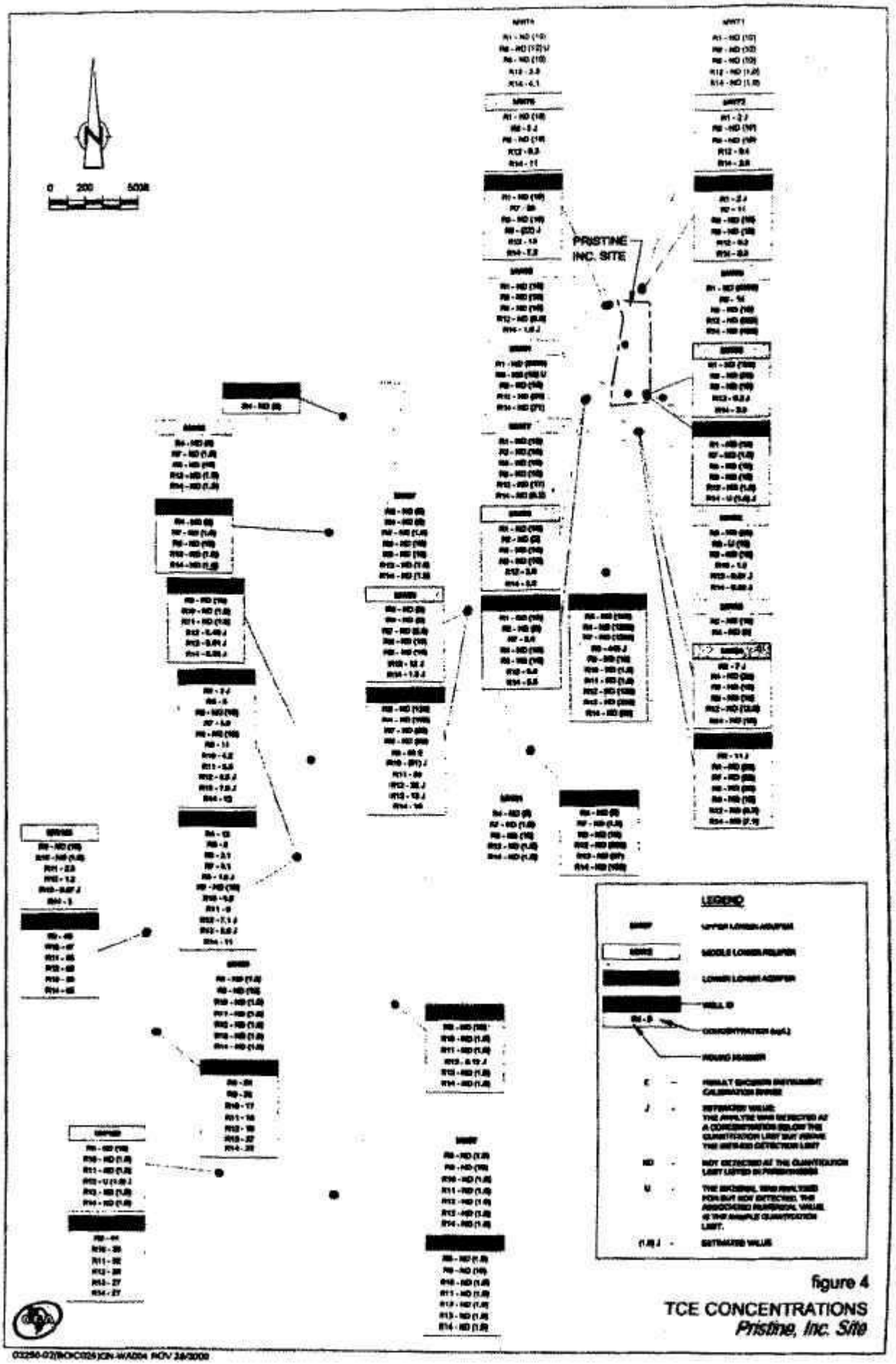

figure 4

TCE CONCENTRATIONS
Pristine, Inc. Site